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## EXERCISE 28 AMPHIBIA: OBSERVATION AND CLASSIFICATION OF THE SPECIMENS

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### 28.1 INTRODUCTION

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The class Amphibia (Gr. *amphi* = dual; *bios* = life) as you will recall from Unit 2, Block 1, of the LSE-10 course includes animals that are able to live in water as well as on land, hence they are amphibious and are called amphibians. Their skin is soft, slimy and naked. The exoskeletal structures are absent in them. The body is differentiated into head, trunk and tail regions. Paired appendages in the form of pentadactyle limbs are present. However, forelimbs are with four and hind limbs are with five digits. Hind limbs are longer than forelimbs. In some forms the limbs are absent and cannot be visualised. The digits are without claws. The skull is autostylic with two occipital condyles; cranium is cartilaginous and later replaced by bony elements. The respiratory organs are gills, lungs and also the integument. Gills are present only during development or may be permanently present in the adult. The heart is three chambered and there are both systemic arches. Both the hepatic portal and the renal portal systems are present. The external ear is absent and the middle ear has a rod-like structure – the columella. Kidneys are provided with persistent nephrostomes. The eggs are with a gelatinous covering, usually laid in water. The larva is aquatic and herbivorous in nature.

In the present exercise you will study some selected specimens of amphibians in order to know their characteristics, identification, habit and habitat and their geographical distribution.

#### Objectives

After completing this exercise, you will be able to:

- identify the given specimens and give their scientific/common name,
- classify the identified specimens up to level of order and list the characters justifying their classification, mention the habit, habitat and geographical distribution and special features, if any of the identified genera,
- draw well labelled diagram of the genera,

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### 28.2 MATERIAL REQUIRED

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1. The museum specimens of the following animals:
  - i) *Ambystoma* (Spotted salamander or tiger salamander)
  - ii) Axolotl larva of *Ambystoma*
  - iii) *Necturus* (Mud puppy)

- iv) *Ichthyophis*
- v) *Hyla* (Tree frog)
- vi) *Bufo* (Toad)
- vii) *Rana* (Green frog)

## 28.3 OBSERVATION OF AMPHIBIANS

Amphibians as you know are adapted to live in water as well as on land. Study the general characters of the given specimens so as to understand the adaptations for amphibious life.

### 28.3.1 *Ambystoma*

- Examine the specimen of *Ambystoma* (Spotted salamander or Tiger salamander) carefully and observe with help of Figure 28.1 the head, the trunk and the tail regions. Study carefully the limbs and the digits.

General characters

- i) *Ambystoma* is lizard-like with yellow spots on the black background of the body.
- ii) It is, therefore, called as Tiger salamander or spotted salamander.
- iii) Head is depressed with a wide mouth.
- iv) Eyes distinct with movable eye lids.
- v) Neck with a prominent gular fold.
- vi) Intercostal grooves present on both sides of the trunk.
- vii) A pair of large parotid glands present which produce poisonous secretion.
- viii) Gills and gill slits are absent in the adult. Respiration by lungs.
- ix) Limbs stout and are of equal size; fore limbs with four digits and hind limbs with five digits, without claws or web.
- x) Tail is compressed without tail fin.
- xi) The adult returns to water for laying eggs.
- xii) Larval life is prolonged and the larva is known as Axolotl larva. The larva becomes sexually mature and reproduces: a phenomenon known as Neoteny.

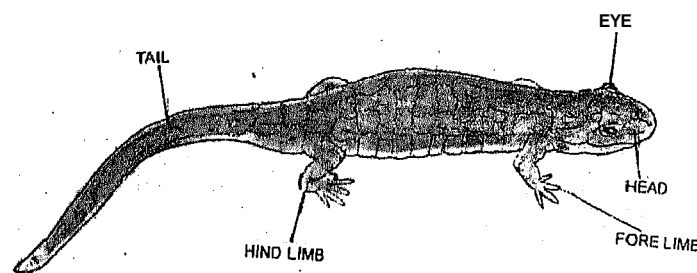


Fig. 28.1: *Ambystoma*.

Habit and Habitat

Fresh water animal usually found in ponds, lakes and rivers.

General Distribution

*Ambystoma* is found in North America from Southern Alaska to Mexico.

Classification and its Justification

Kingdom	<b>Animalia</b>	. Animals, multicellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
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Phylum	<b>Chordata</b>	Dorsal tubular nerve cord, notochord and paired gill-slits are present.
Group	<b>Vertebrata (Craniata)</b>	Notochord is replaced by vertebral column; two pairs of appendages; circulatory system closed; hepatic portal system present; blood containing R.B.C.
Superclass	<b>Gnathostomata</b>	Jaws and paired appendages are present.
Class	<b>Amphibia</b>	Can live in water and on land. The fore limbs and hind limbs are of equal size. Limbs with digits. Skin soft and glandular.
Order	<b>Urodela/Caudata</b>	The tail persists throughout life. The external gills of larva may or may not persist.
Genus	<b><i>Ambystoma</i></b>	
Common name	<b>Spotted Salamander or Tiger salamander</b>	

**28.3.2 Axolotl larva of *Ambystoma*.**

Study the specimen carefully and note the details from all the angles.

**General Characters**

- i) The body of axolotl larva (Fig. 28.2) is lizard-like and stout, and tail is with tail fin (without fin rays) extending up to the back of the body.
- ii) External gills in three pairs and gill slits four pairs.
- iii) Forelimbs with four digits and hindlimb with five digits and arc of equal size.
- iv) The larva develops gonads and reproduces like adult. The phenomenon is known as neoteny.
- v) The metamorphosis occurs when there is scarcity of water and food or there is an increased concentration of iodine in water. During metamorphosis it sheds off gills and tail fin and develops lungs.

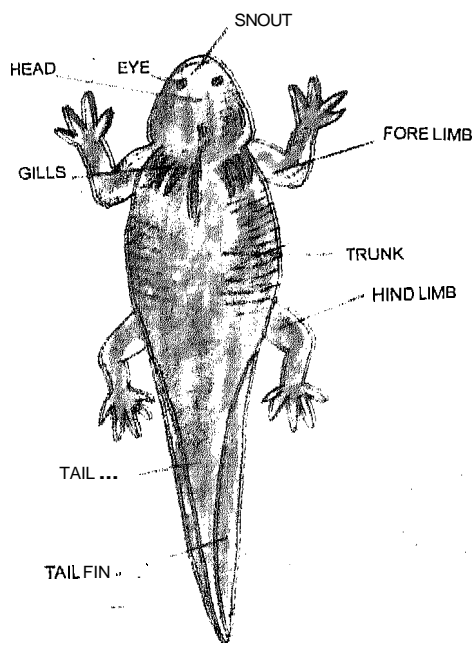


Fig. 28.2: Axolotl larva of *Ambystoma*.

**Habit and Habitat**

Lives in fresh water rivers, ponds and lakes.

**General Distribution**

It is found in mountain regions of Mexico.

Classification and its Justification

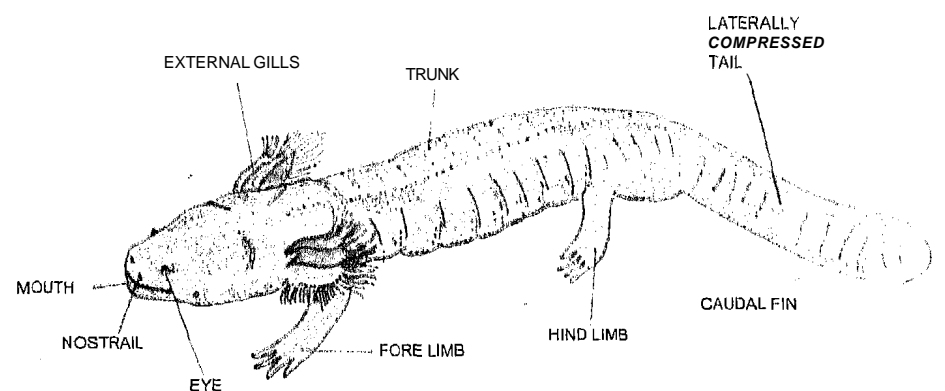
Kingdom	Animalia	Animals, multicellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	Chordata	Dorsal tubular nerve cord, notochord and paired gill-slits are present.
Group	Vertebrata (Craniata)	Notochord is replaced by vertebral column; three pairs of appendages; circulatory system closed; hepatic portal system present; blood containing R.B.C.
Superclass	<b>Gnathostomata</b>	Jaws and paired appendages are present.
Class	<b>Amphibia</b>	Can live in water and on land. The fore limbs and hind limbs are of equal size. Limbs with five digits. Skin soft and glandular.
Order	<b>Urodela/Caudata</b>	The tail persists throughout life. The external gills of larva may or may not persist.
Genus	<i>Ambystoma larva</i> (Axolotl larva)	

**28.3.3 Necturus**

**Observe** the specimen of *Necturus* (Mud puppy) from all angles and study the following characters.

General Characters

- i) *Necturus* (Mud puppy or Water newt) (Fig. 28.3) has a stout body with rusty brown colour and black spots.
- ii) Head is flattened and marked off from the trunk by a constriction.
- iii) Eyes covered by transparent fold of integument.
- iv) Limbs weak, short and with four digits, adapted for crawling.
- v) Skull cartilagenous.
- vi) Tympanum and eye lids absent.
- vii) It has three pairs of bushy red coloured external gill slits.
- viii) Tail laterally compressed with tail fin.
- ix) Lateral line system present.
- x) Larval circulatory system present.



**Fig. 28.3: Necturus (Mud puppy).**

**Habit and Habitat**

It is an aquatic salamander. Lives in fresh water.



General Distribution

It is found in North America, Yugoslavia.

Classification and its Justification

Kingdom	Animalia	Animals, multicellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	Chordata	Dorsal tubular nerve cord, notochord and paired gill-slits are present.
Group	Vertebrata (Craniata)	Notochord is replaced by vertebral column; two pairs of appendages; circulatory system closed; hepatic portal system present; blood containing R.B.C.
Superclass	Gnathostomata	Jaws and paired appendages are present.
Class	Amphibia	Can live in water and on land. The fore limbs and hind limbs are of equal size. Limbs with digits. Skin soft and glandular.
Order	Urodela/Caudata	The tail persists throughout life. The external gills of larva may or may not persist.
Genus	<i>Necturus</i>	
Common name	Mud puppy or Water newt	

28.3.4 *Ichthyophis*

Study the specimen of *Ichthyophis* from all the angles and observe the details.

General characters

- i) The body of *Ichthyophis* (Fig. 28.4) is elongated and 'Worm like'.
- ii) Minute scales are present which are concealed in the wrinkled skin.
- iii) Slime glands and squirt glands are present in the skin. Squirt glands produce irritating fluid.
- iv) Limbs and limb girdles absent,

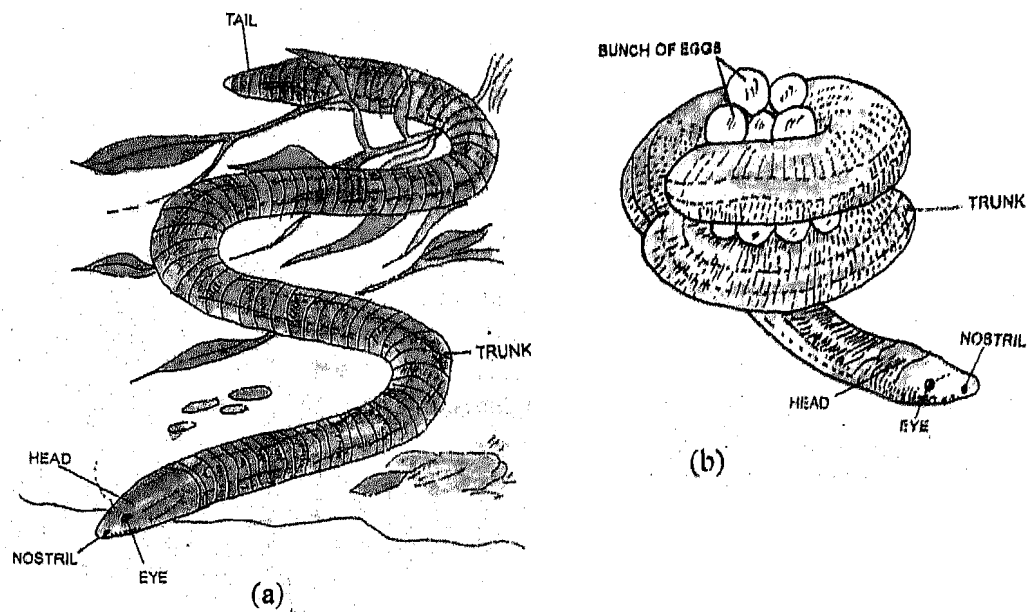


Fig. 28.4: *Ichthyophis*. n) Male. b) Female.

- v) Tail vestigial and anus is subterminal.
- vi) Head conical with a pair of nostrils, eyes and sensory tentacular apparatus.
- vii) Eyes rudimentary and buried deep in the skin
- viii) Tympanic membrane, tympanic cavity and columella absent.
- ix) Vertebrae **many** and amphicoelous.
- x) It can be identified as a limbless amphibian with a vestigial tail and has calcified scales.

Habit and Habitat

Burrowing type in muddy areas. Exhibits parental care. The female coils around the eggs and carry them till they are hatched (Fig. 28.4 b). The larva possesses three pairs of finely branched external gills.

General Distribution

Found in tropical regions of India, Sri Lanka, Borneo, Java, Philippines and Malaysia.

Classification with its Justification

Kingdom	<b>Animalia</b>	Animals, multicellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	<b>Chordata</b>	Dorsal tubular nerve cord, notochord and paired gill-slits are present.
Group	Vertebrata (Craniata)	Notochord is replaced by vertebral column; two pairs of appendages; circulatory system closed; hepatic portal system present; blood containing R.B.C.
Superclass	Gnathostomata	Jaws and paired appendages are present.
Class	<b>Amphibia</b>	Can live in water and on land. The fore limbs and hind limbs are of equal size. Limbs with digits. Skin soft and glandular.
Order	<b>Apoda/Gymnophiona</b>	Limbless, burrowing, body worm-like and without tail; body surface wrinkled and with minute scales that form the exoskeletal structures.
Genus	<i>Ichthyophis</i>	

28.3.5 *Hyla*

Study the specimen of *Hyla* (Tree frog) animal in the jar from all the directions and note the details.

General Characters

- i) *Hyla* (Tree frog) (Fig. 28.5) has a slender body adapted for arboreal life.
- ii) Skin smooth on the dorsal side and papillated on the ventral side, with hygroscopic glands on the belly and throat regions.
- iii) The digits have terminal adhesive discs. These stick to the surface and are used in climbing on trees.
- iv) Web between the toes of hind limbs extensively developed and is useful in leaping from one branch to another.
- v) Teeth present only in the upper jaw; lower jaw is edentulous.
- vi) Vocal sacs present in male *Hyla*. These are very large and produce loud noise.
- vii) Exhibit protective coloration; can change its colour according to the environment.
- viii) Eggs are laid in water but in *Hyla goeadii*, the eggs are carried on the back of the female. Thus, it exhibits parental care.
- ix) It can be identified by the presence of adhesive discs on the tips of digits.

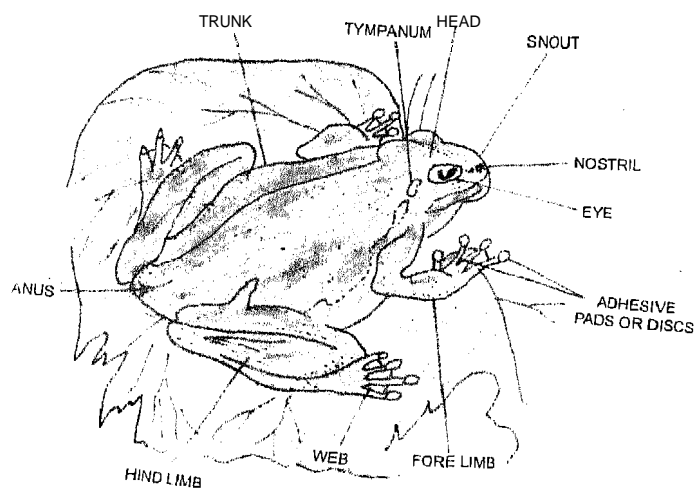


Fig. 28.5: *Hyla*.

#### Habit and Habitat

Found in **damp** forests and can climb trees.

#### General Distribution

It is cosmopolitan; found in India, China, Java, United States of America, Africa, Canada.

#### Classification and its Justification

Kingdom	<b>Animalia</b>	Animals, multicellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	Chordata	Dorsal tubular nerve cord, notochord and paired gill-slits are present.
Group	Vertebrata (Craniata)	Notochord is replaced by vertebral column; two pairs of appendages; circulatory system closed; hepatic portal system present; blood containing R.B.C.
Superclass	Gnathostomata	Jaws and paired appendages are present.
Class	Amphibia	Can live in water and on land. The fore limbs and hind limbs are of equal size. Limbs with digits. Skin soft and glandular.
Order	Anura	Adults without tail; External gill slits absent; body broad and hind limbs strong and powerful.
Genus	<b><i>Hyla</i></b>	
Common name	Tree frog	

#### 28.3.6 *Bufo*

Observe **the** specimen of **Bufo** (Toad) from all angles to study **the** details.

#### General Characters

- i) **Bufo** (Toad) (Fig. 28.6) is a true toad.
- ii) Skin dry, rough, warty and with poison glands. Skin is protective in function and non-respiratory.

- iii) Eyes are large and behind the eyes are present a pair of parotid glands.
- iv) Forelimbs without web and hindlimbs with poorly developed web and with horny tips.
- v) The tongue is pear shaped and thicker in front, and free behind but not bifid.
- vi) Vertebrae procoelous; and both the jaws are edentulous.
- vii) Epicoracoids of the pectoral girdle overlap (arciferous) and omosternum absent.
- viii) Eggs are pigmented and laid in water forming gelatinous string.
- ix) The secretion of parotid gland is poisonous. It contains two toxic substances bufotalous and bufogus. These toxins if swallowed cause nausea, respiratory and muscular disorders and heart malfunctioning.

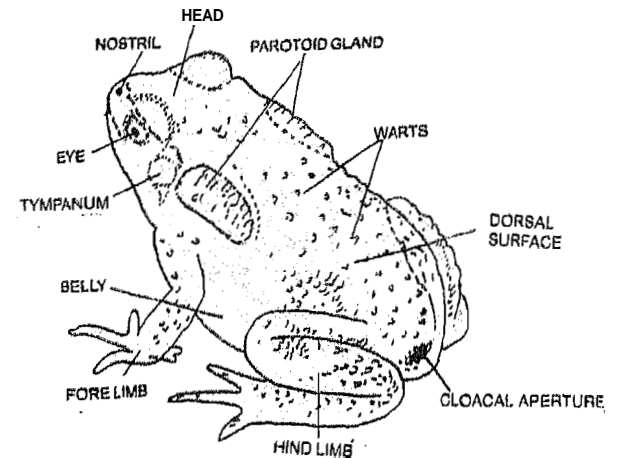


Fig. 28.6: *Bufo*.

**Habit and Habitat**

Nocturnal, lives in shady area. Carnivorous, feeds on worms, insects and snails.

**General Distribution**

Found all over the world except Australia and Madagascar.

**Classification and its Justification**

Kingdom	<b>Animalia</b>	Animals, multicellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	<b>Chordata</b>	Dorsal tubular nerve cord, notochord and paired gill-slits are present.
Group	<b>Vertebrata (Craniata)</b>	Notochord is replaced by vertebral column; two pairs of appendages; circulatory system closed; hepatic portal system present; blood containing R.B.C.
Superclass	<b>Gnathostomata</b>	Jaws and paired appendages are present.
Class	<b>Amphibia</b>	Can live in water and on land. The fore limbs and hind limbs are of equal size. Limbs with digits. Skin soft and glandular.
Order	<b>Anura</b>	Adults without tail; External gill slits absent; body broad and hind limbs strong and powerful.
Genus	<b><i>Bufo</i></b>	
Common name	<b>Toad</b>	



### 28.3.7 *Rana*

Observe the details of the specimen of *Rana* (Green frog) from all the angles.

#### General Characters

- i) *Rana* (Green frog) (Fig. 28.7) has a slender, elongated body.
- ii) Digits are webbed and end in feeble claws.
- iii) Eyes large with eyelids.
- iv) Head broad and nearly conical.
- v) Females are larger than the males.

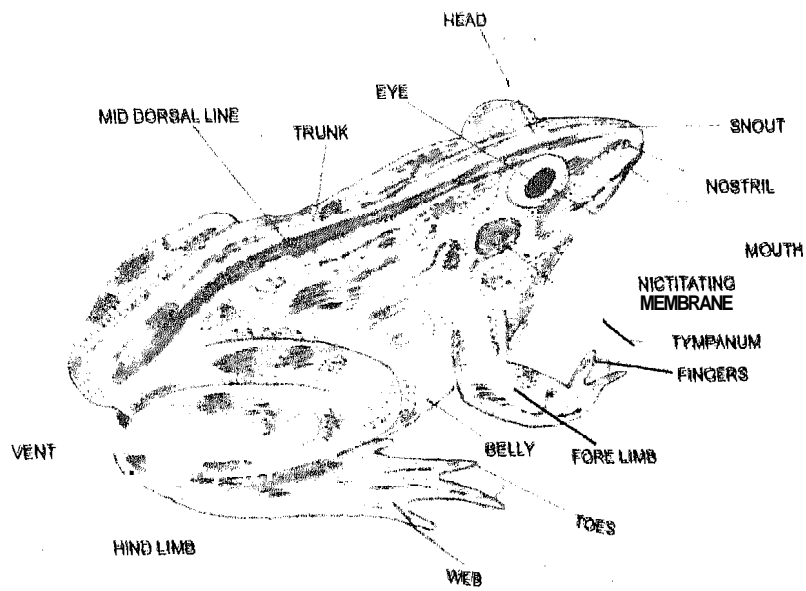


Fig. 28.7: *Rana*.

#### Habit and Habitat

Found in moist places, freshwater ponds and streams. The adults are carnivorous.

#### General Distribution

Distributed all over the world.

#### Classification and its Justification

Kingdom	<b>Animalia</b>	Animals, multicellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	Chordata	Dorsal tubular nerve cord, notochord and paired gill-slits are present.
Group	Vertebrata (Craniata)	Notochord is replaced by vertebral column; two pairs of appendages; circulatory system closed; hepatic portal system present; blood containing R.B.C.
Superclass	Gnathostomata	Jaws and paired appendages are present.
Class	<b>Amphibia</b>	Can live in water and on land, The fore limbs and hind limbs are of equal size. Limbs with digits. Skin soft and glandular.

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### 28.4 TERMINAL QUESTIONS

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1. In what ways do you think that the amphibians are better evolved than fishes'?

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2. Define neoteny. Explain this phenomenon with an example studied by you.

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3. In what ways have the living amphibians adapted themselves for a life on land?

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